

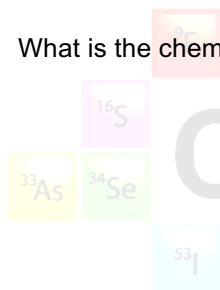
AP WORKSHEET 08CDEGHIJ: Weak Acids, Titrations and Buffers

1. Lactic acid ( $C_3H_6O_3$ ) and hydrocyanic acid (HCN) have  $K_a$  values of  $1.38 \times 10^{-4}$  and  $6.17 \times 10^{-10}$  respectively.

(a) Write an equation to show how HCN reacts with water, and identify each acid/base conjugate pair. Label clearly. (3)

(b) Which is the stronger acid, lactic or hydrocyanic? Explain your answer. (2)

(c) What is the chemical formula of the conjugate base of lactic acid? (1)



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2. 20.0 mL of 0.100 M lactic acid solution is titrated with 0.100 M NaOH solution. Calculate the pH of the contents of the Erlenmeyer flask at each of the following points during the titration.

(a) When 0.00 mL of NaOH have been added. (2)

(b) After 5.00 mL of NaOH have been added. (3)

(c) After 20.0 mL of NaOH have been added. (3)

(d) After 10.0 mL of NaOH have been added. (1)

(e) After 25.0 mL of NaOH have been added. (2)

(f) A buffer solution exists in the flask after 5.00 mL of NaOH have been added. Write equations to show the action of the relevant component of the buffer, when acid ( $\text{H}_3\text{O}^+$ ), or base ( $\text{OH}^-$ ), is added from an external source. (2)

3. Explain why a 'good', acidic buffer, has a pH close to the value of the pKa of the acid. (2)
4. What does a buffer with a pH significantly *larger* than the pKa, tell one about the ratio of the acid to salt (conjugate base) ratio? (1)
5. What does a buffer with a pH significantly *smaller* than the pKa, tell one about the ratio of the acid to salt (conjugate base) ratio? (1)

